Tides and Planetary Waves at High Latitudes Measured by Meteor Radars

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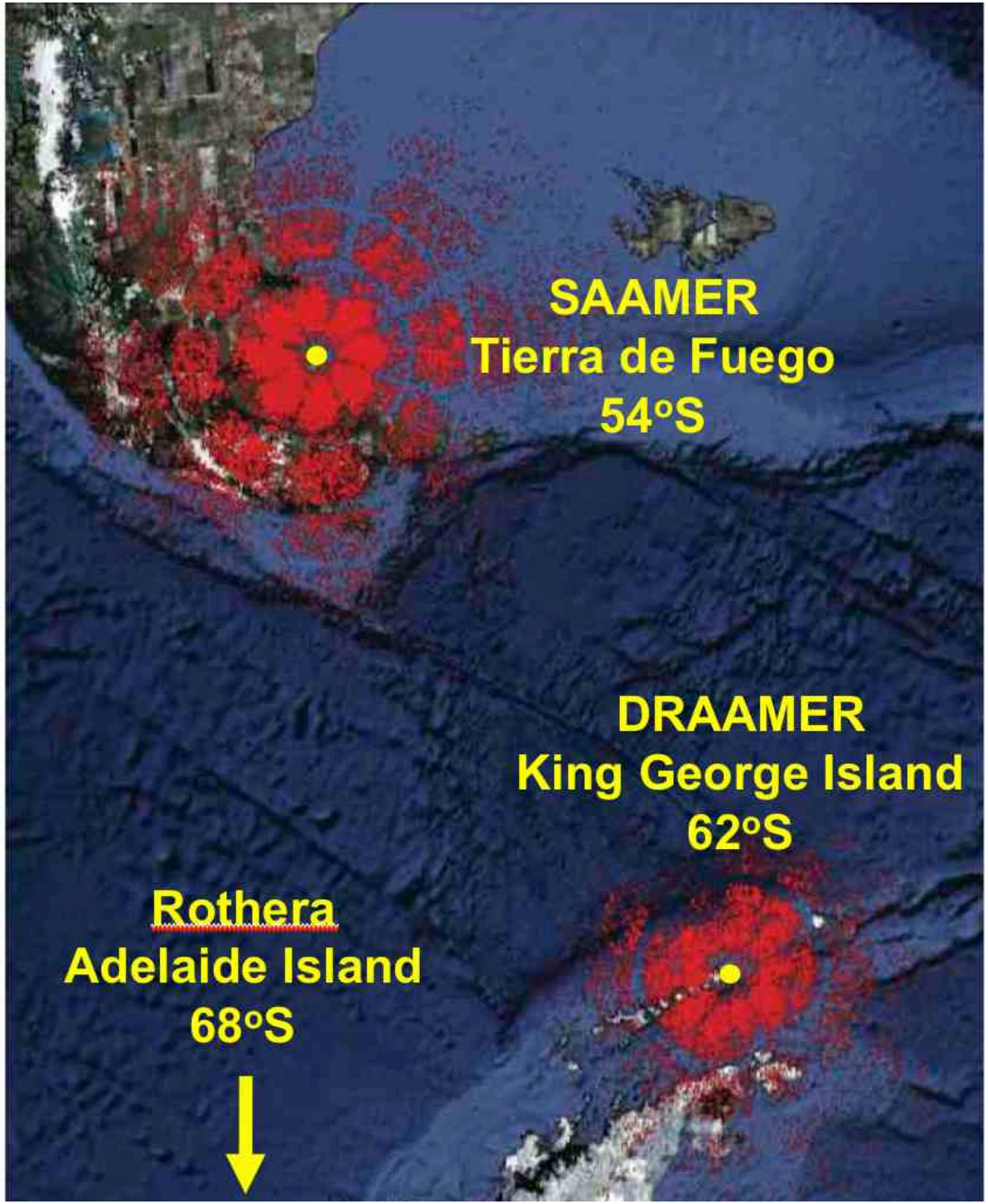
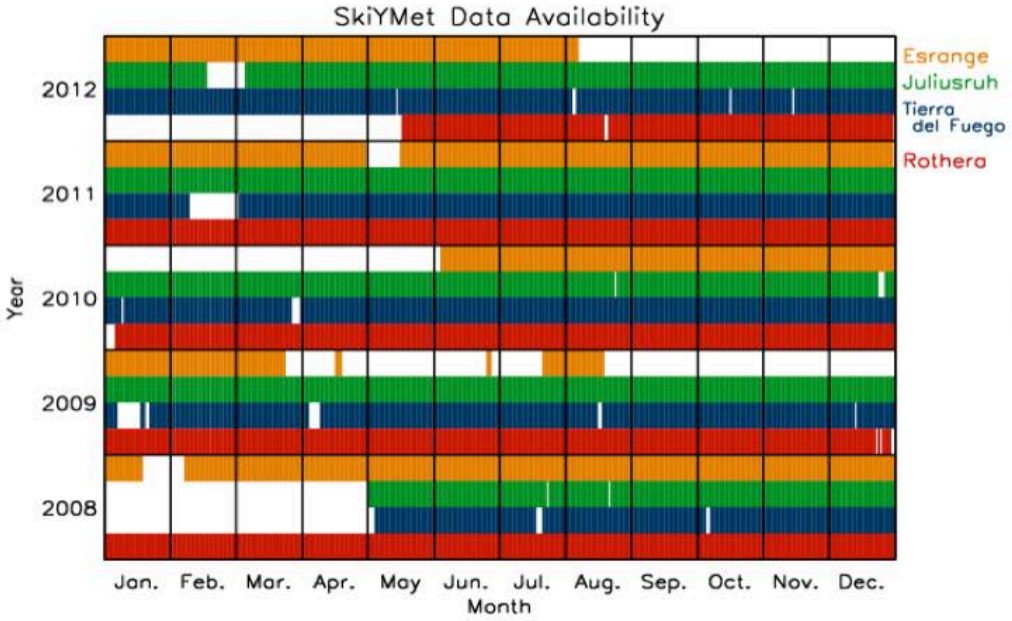
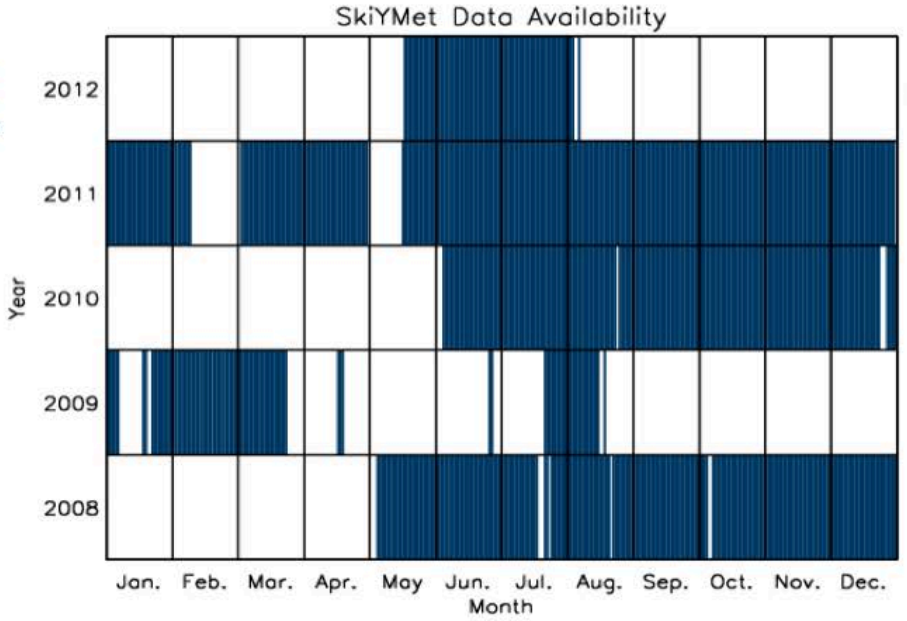
and radars
at conjugate
northern latitudes:

Juliusruh (54.6°N)

Esrange (68°N)



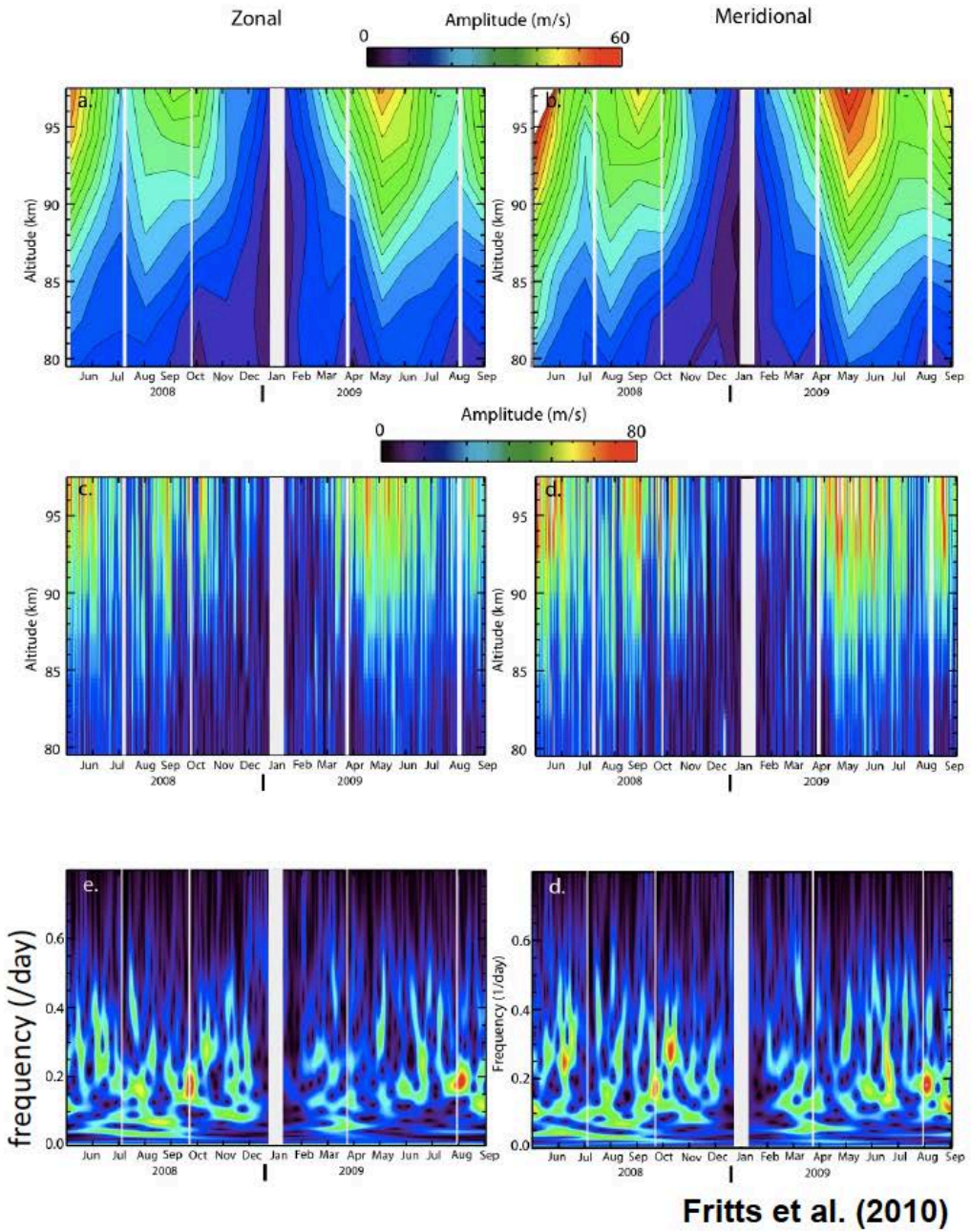

SkiYMet Data Availability
Esrange
Juliusruh
Tierra del Fuego
Rothera
2012
2011
2010
2009
2008
Year
Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sep. Oct. Nov. Dec.
Month


SkiYMet Data Availability
2012
2011
2010
2009
2008
Year
Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sep. Oct. Nov. Dec.
Month

Semidiurnal tide over SAAMER

semidiurnal tide is large and seasonally variable

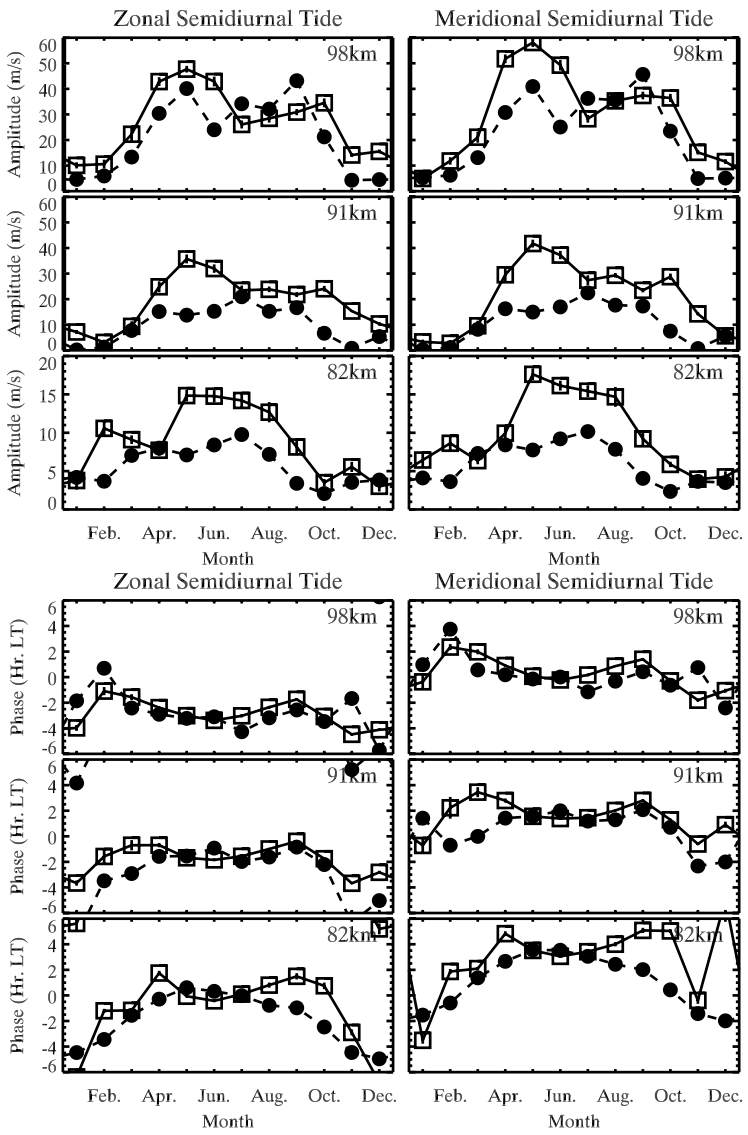
maxima in ~May/June and Aug-Oct

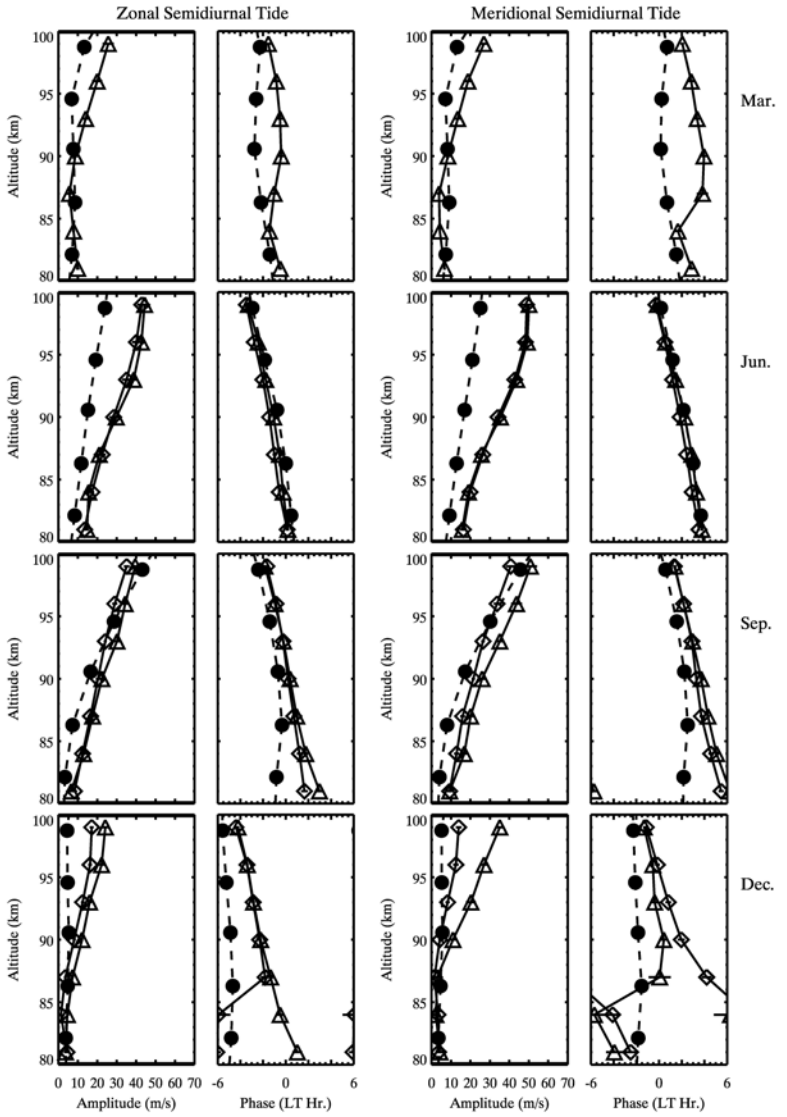


Fritts et al. (2010)

Semidiurnal tides over SAAMER

SD tide is large and variable, larger than GSWM-02 predictions

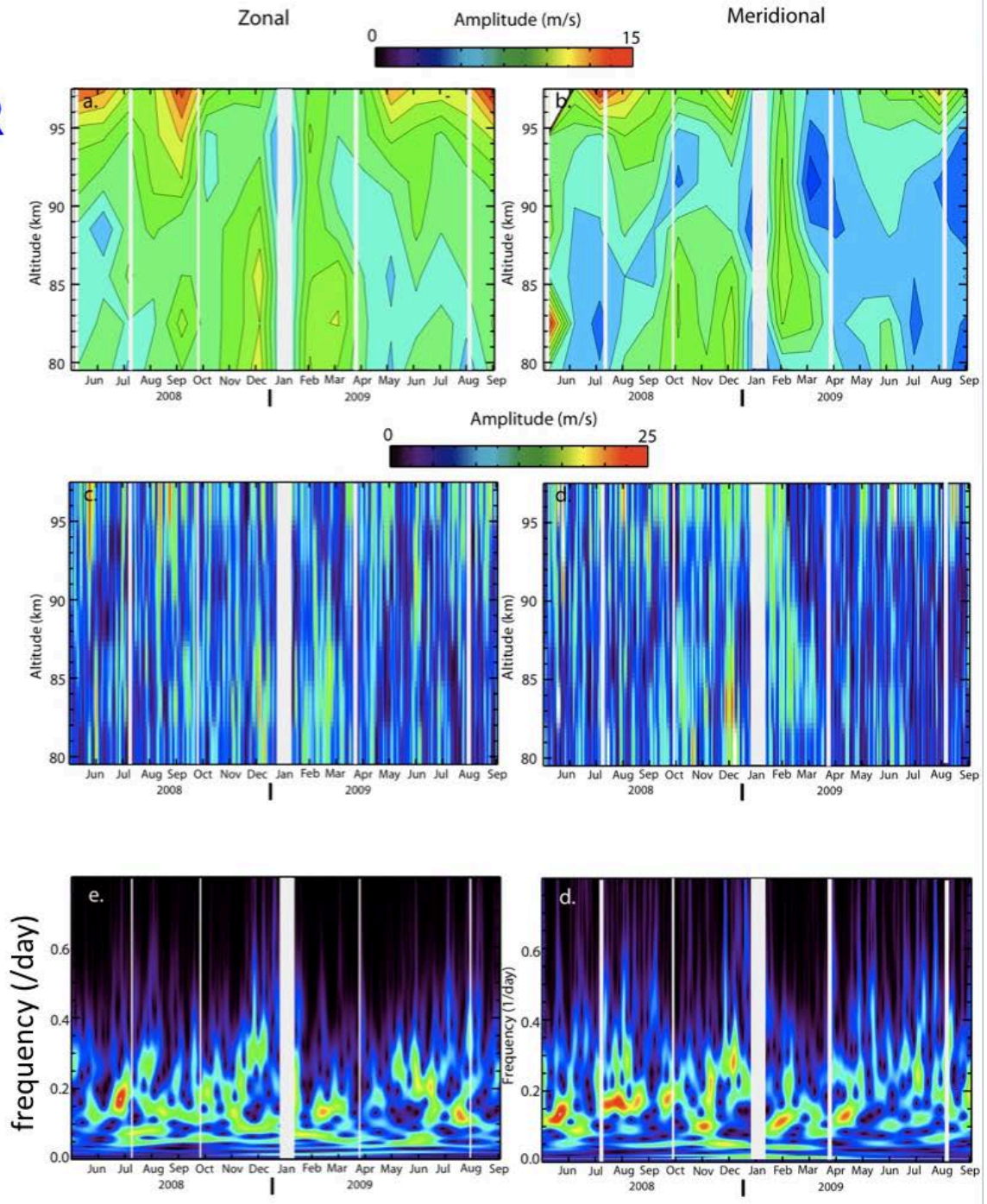




Fritts et al. (2010)

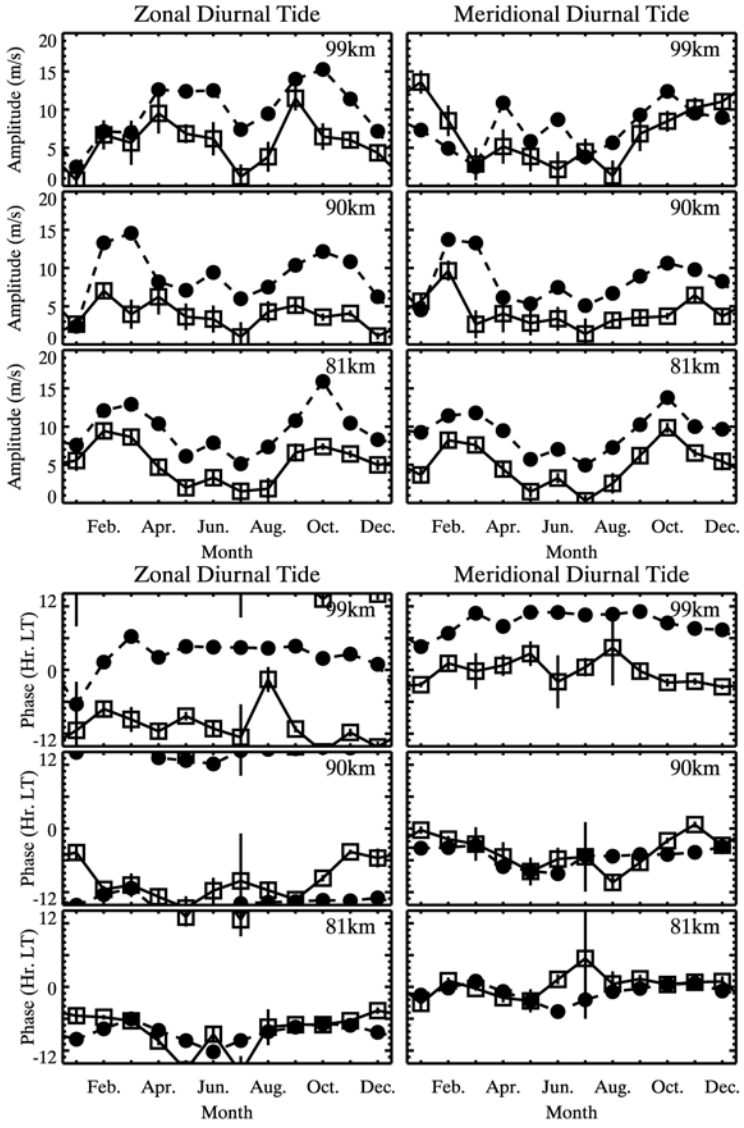
Diurnal tide over SAAMER

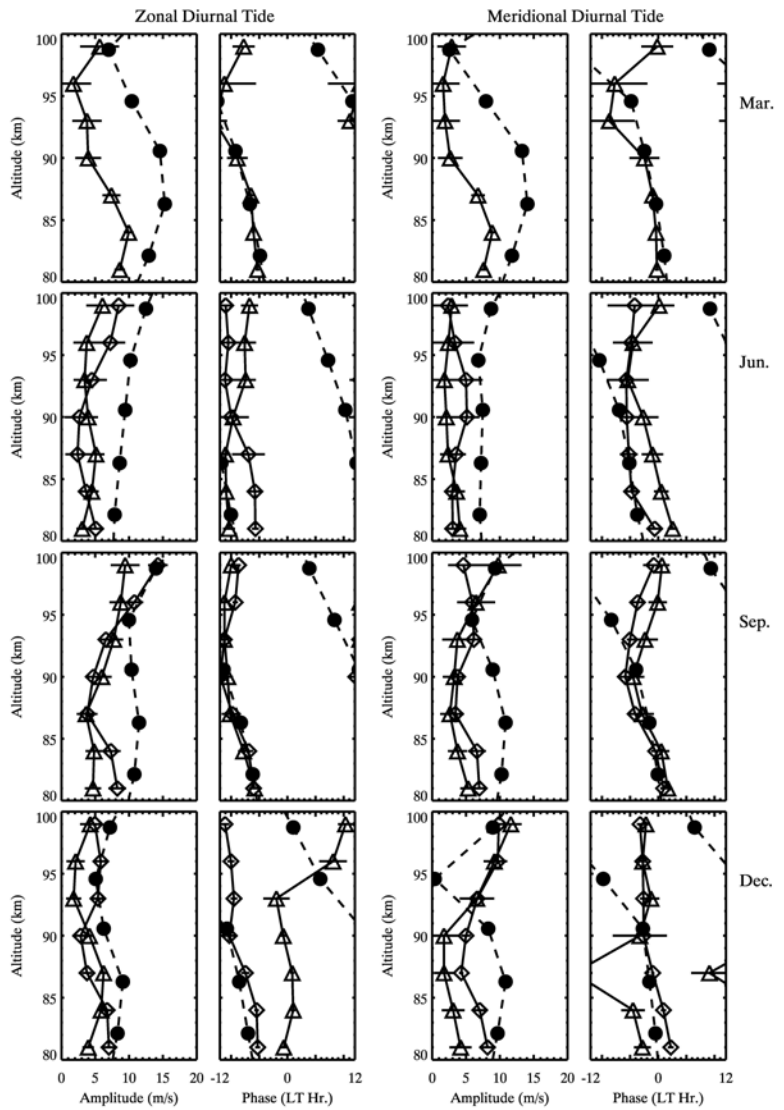
diurnal is much smaller, also highly variable at PW periods



Diurnal tides over SAAMER

Diurnal tide is small and variable, smaller than GSWM-02 predictions





Fritts et al. (2010)

8-10-day and 16-day PWs over Juliusruh (top)and SAAMER (bottom)

- responses of both PWs over Juliusruh are large and largely confined to winter
- as large as ~25 m/s

- responses over SAAMER are smaller and more distributed throughout the year
- as large as ~15 m/s

Juliusruh (55°N)

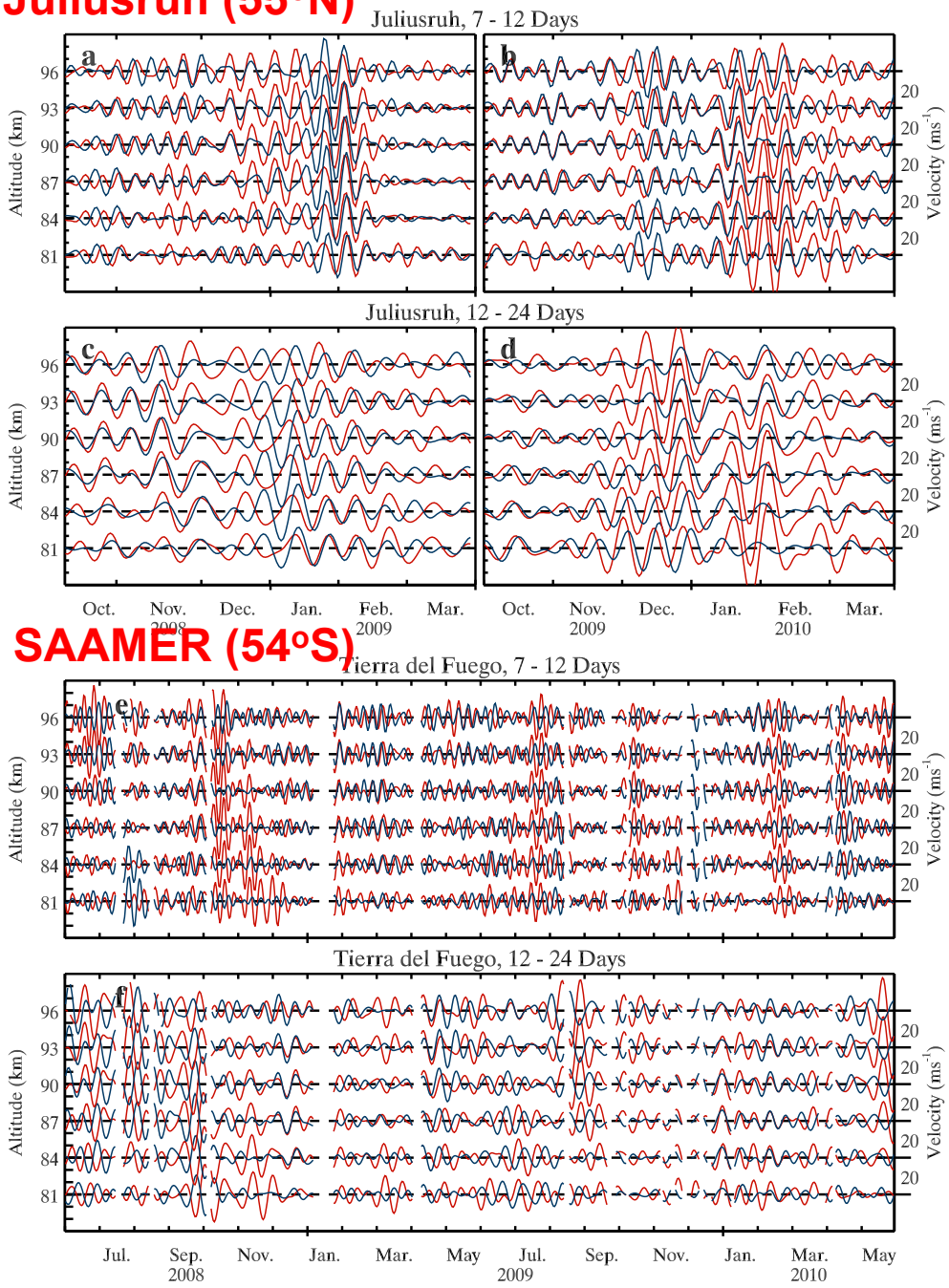
8-10 day

16-day

SAAMER (54°S)

8-10 day

16-day

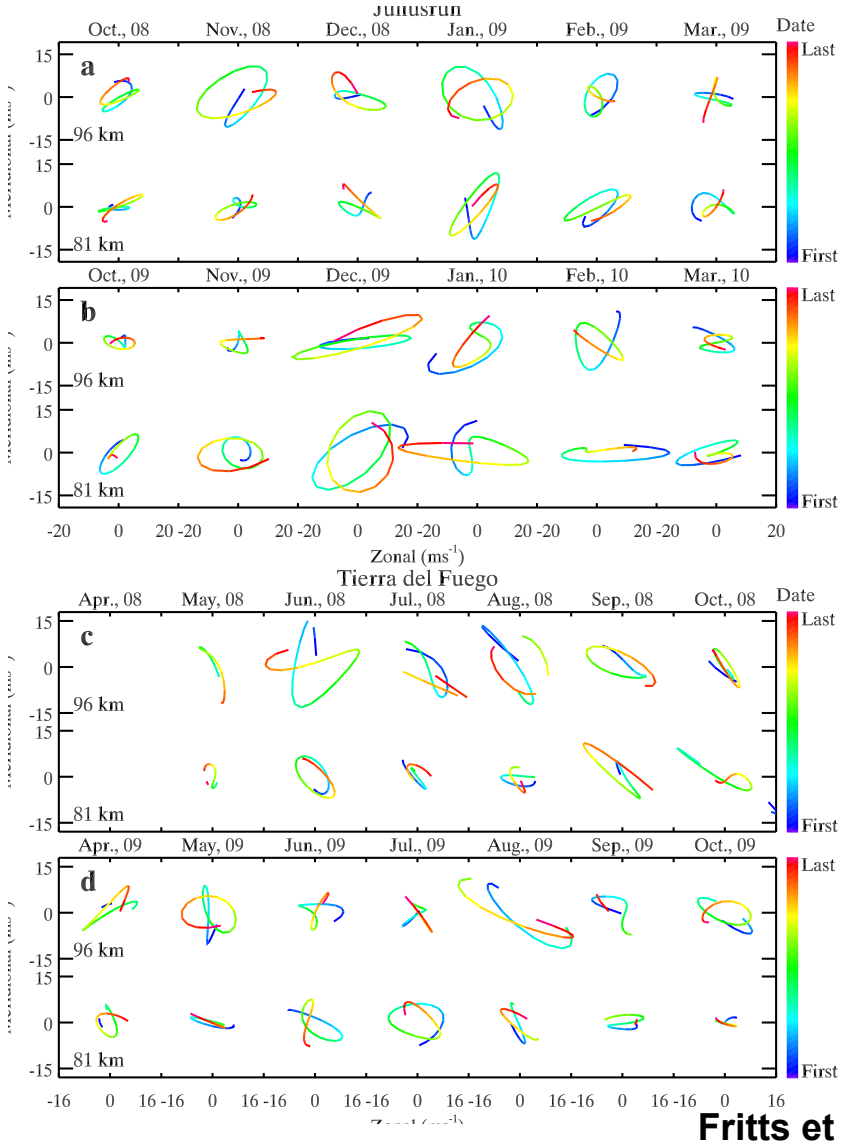


Fritts et al. (2012)

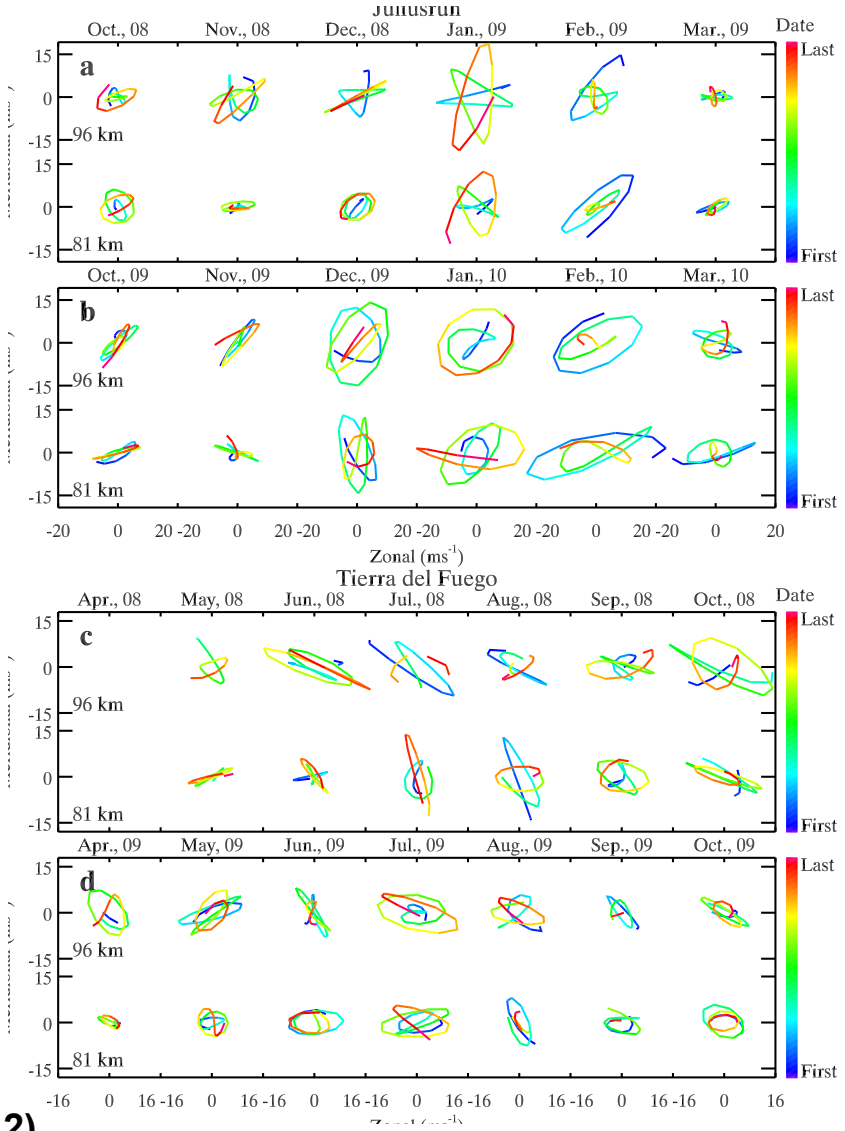
16-day and 8-10-day PWs over SAAMER (bottom) and Juliusruh (top)

- correlations among zonal and meridional winds are highly variable

16-day PW



10-day PW

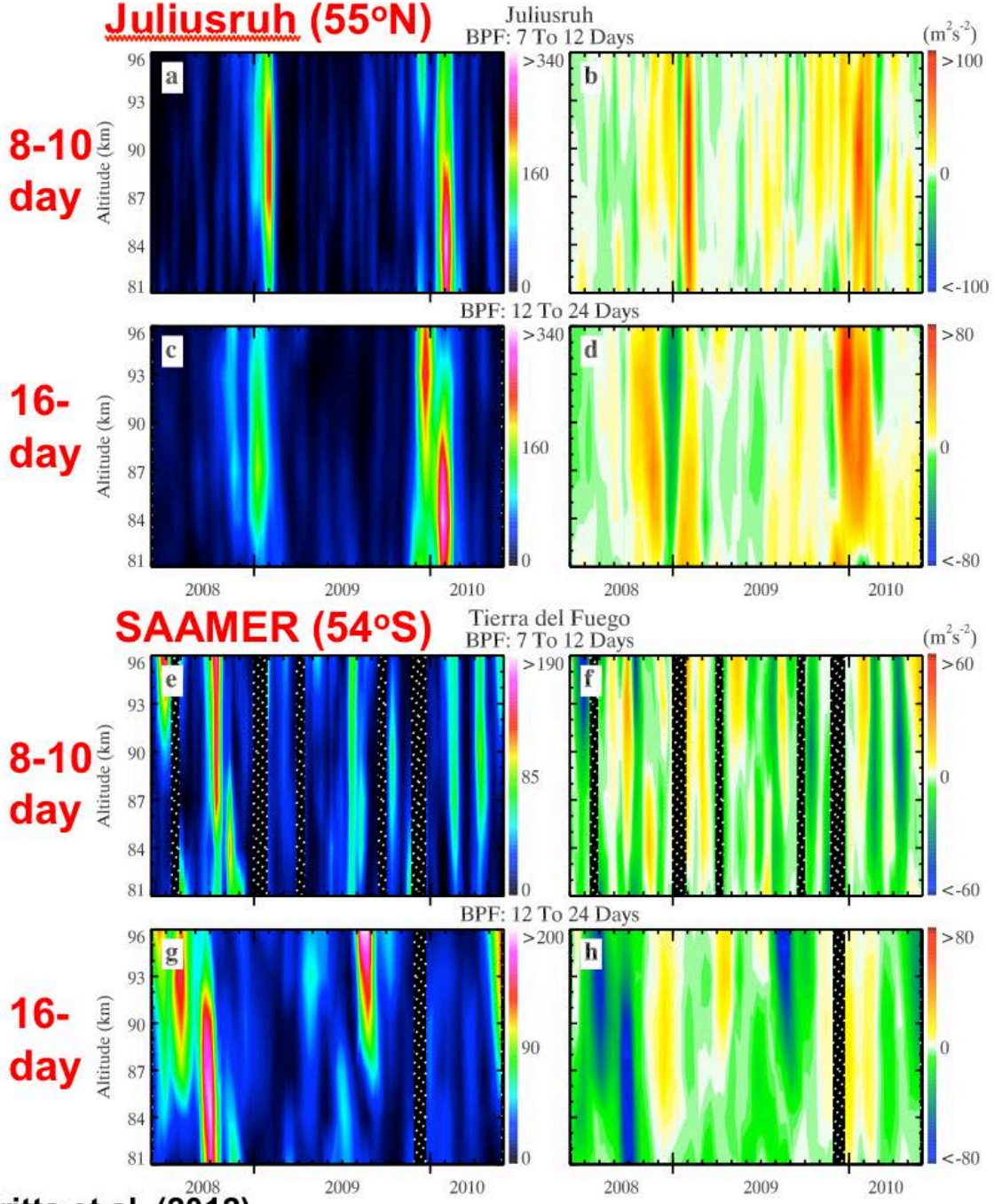


Fritts et al. (2012)

8-10-day and 16-day PW variances and horizontal momentum fluxes (left and right) over SAAMER (bottom) and Juliusruh (top)

- variances of both PWs over Juliusruh are largely confined to winter
- momentum fluxes are positive (poleward) when variances are large

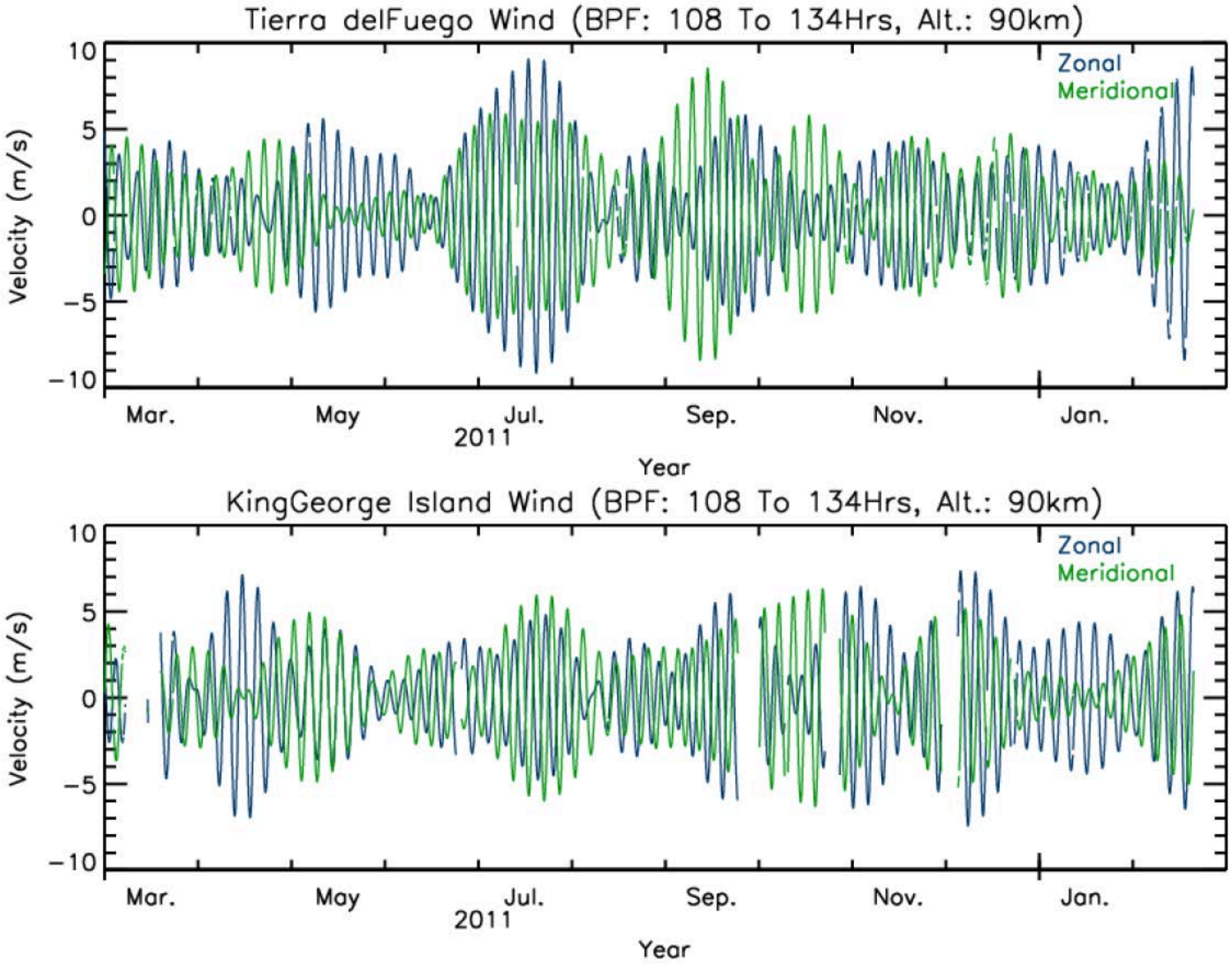
- variances over SAAMER are smaller and more distributed throughout the year
- momentum fluxes for 16-day PW are negative (poleward) when variances are large



Fritts et al. (2012)

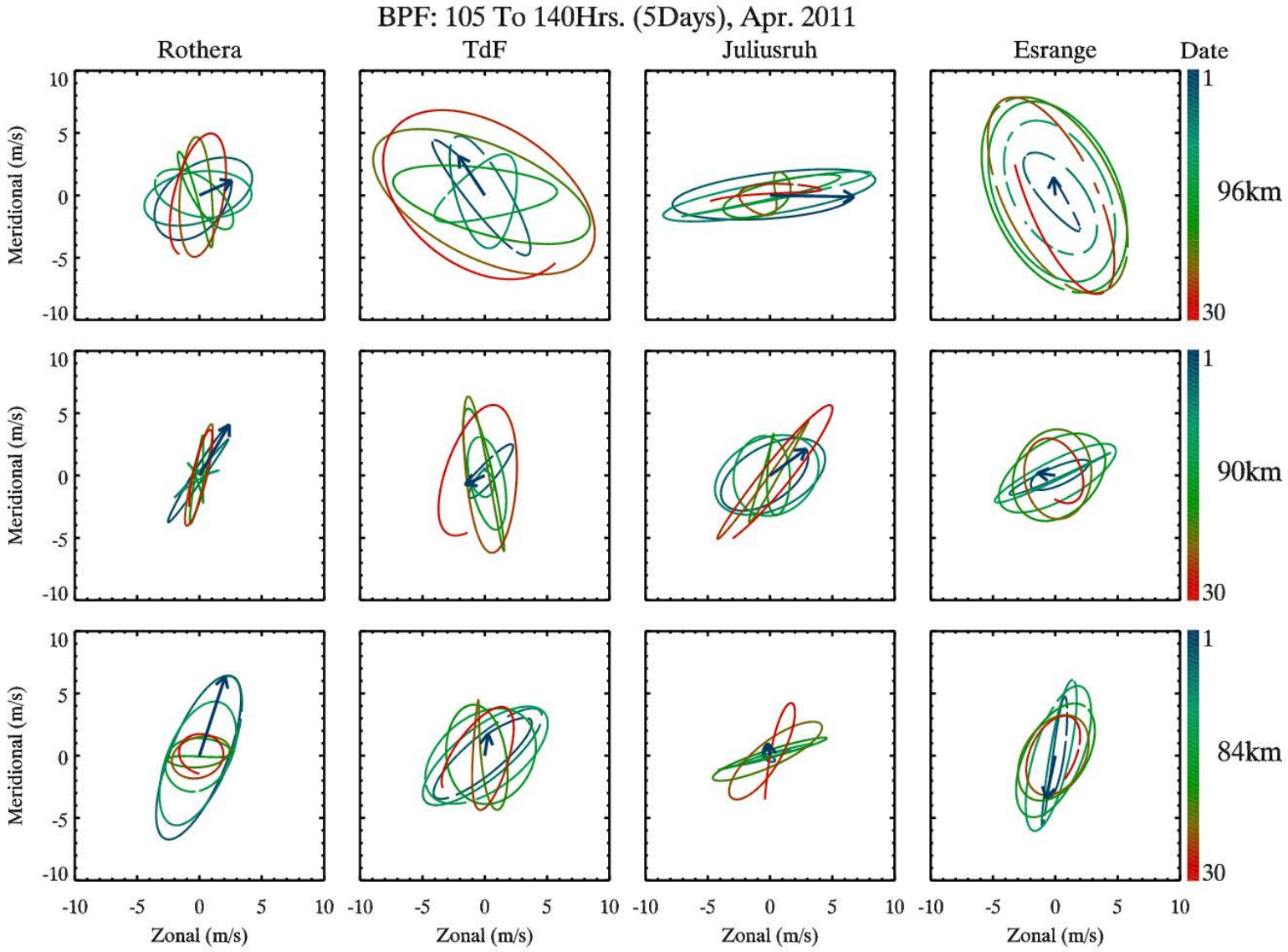
5-day PW over SAAMER (top) and KGI (bottom)

- amplitudes (< 10 m/s) and phases are highly variable throughout the year



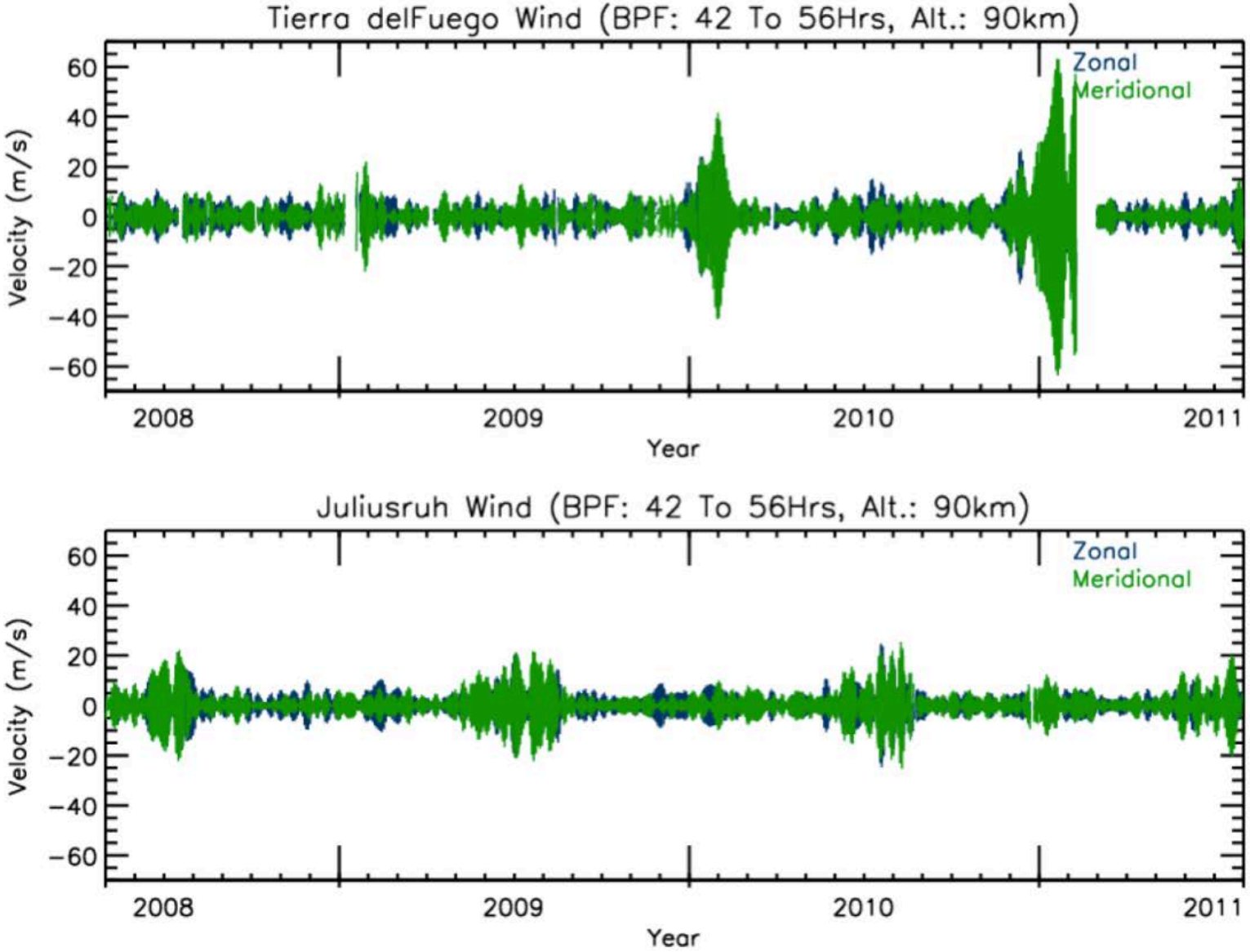
5-day PW over ROT, TdF, JLR, and ESR

- phase structures are also highly variable from site to site



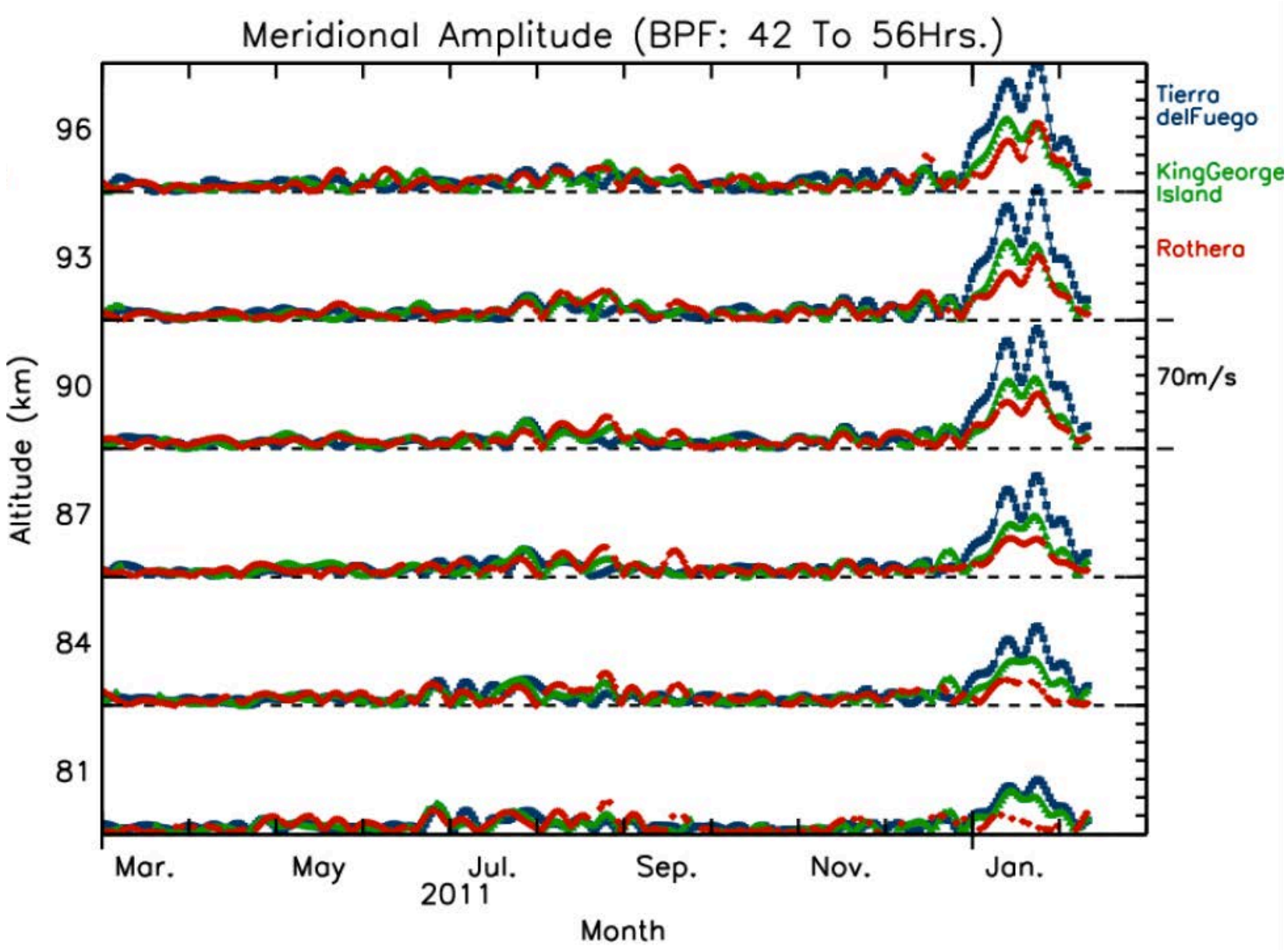
2-day PW over SAAMER (top) and Juliusruh (bottom)

- SH response is much larger, both are largely confined to the summer season



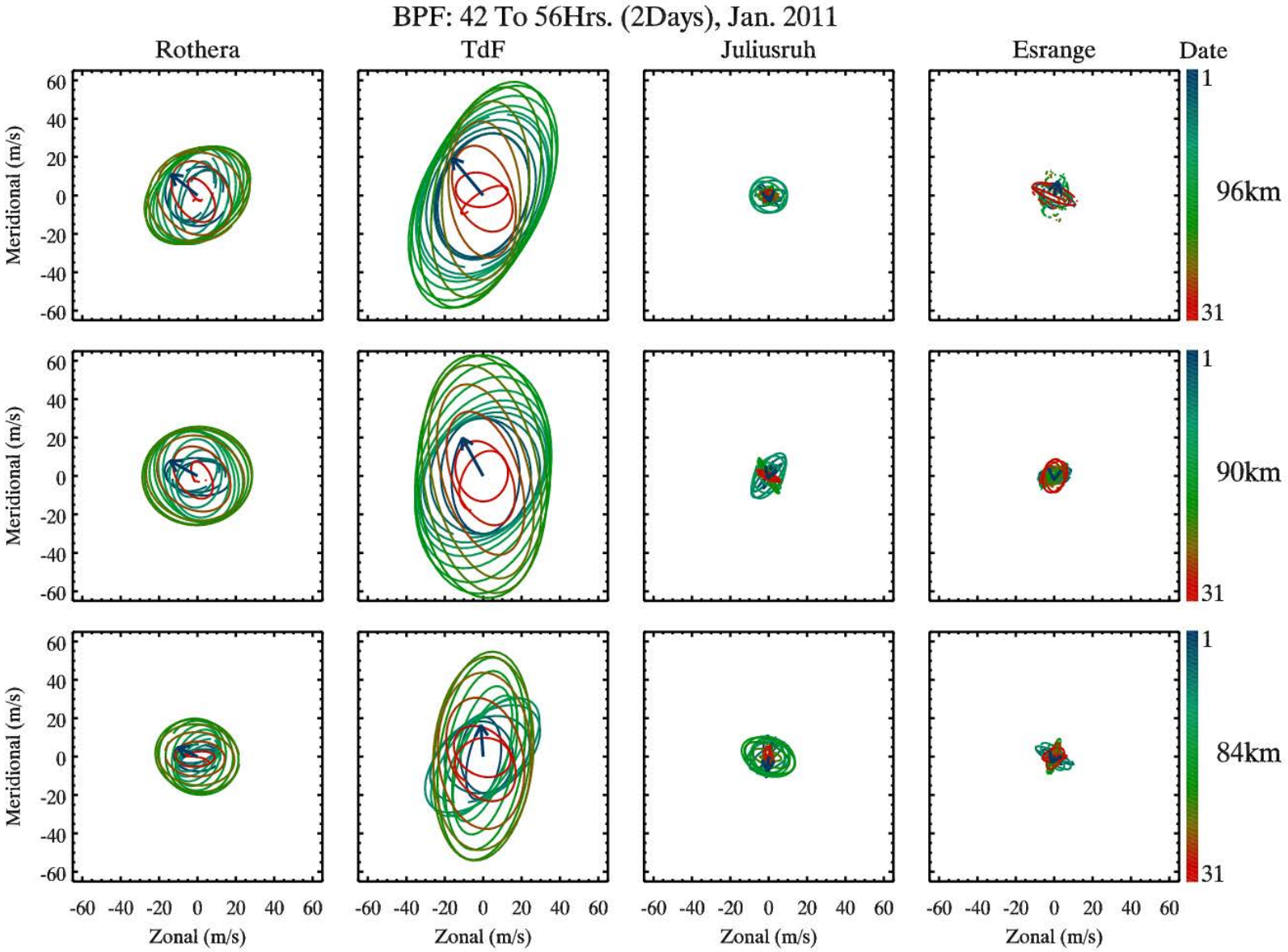
2-day PW over SAAMER, KGI, and Rothera (top to bottom)

- amplitudes increase with altitude, decrease poleward



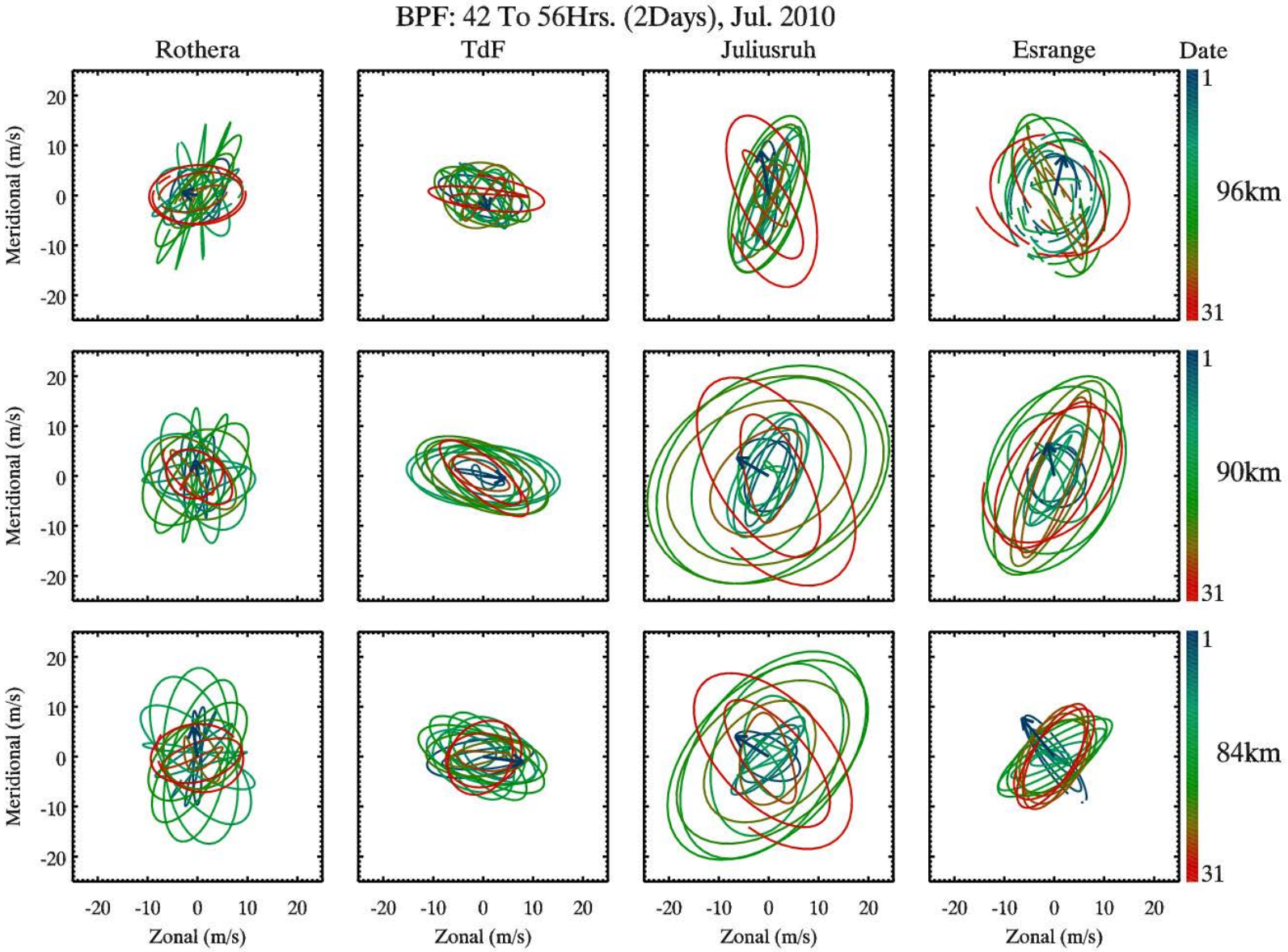
S. Hemis. 2-day PW has strong maximum over TdF

- wind vector rotation tends to be strongly counter-clockwise

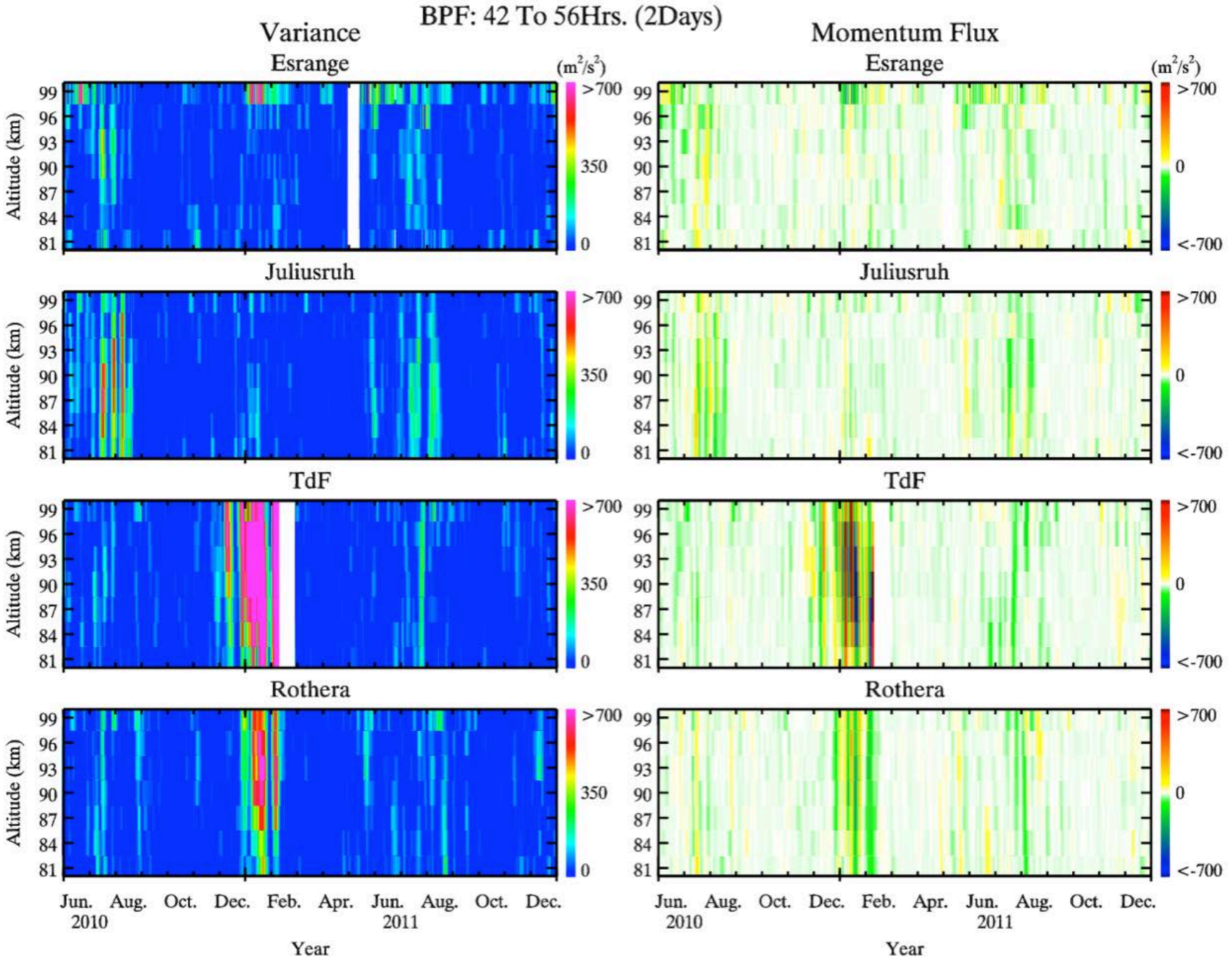


N. Hemis. 2-day PW has weaker maximum over JLR

- wind vector rotation tends to be strongly clockwise



Fritts et al. (2012)


BPF: 42 To 56Hrs. (2Days)
Variance
Momentum Flux
Esrange
Juliusruh
TdF
Rothera
Altitude (km)
99
96
93
90
87
84
81
(m²/s²)
>700
350
0
<-700
Jun.
Aug.
Oct.
Dec.
Feb.
Apr.
Jun.
Aug.
Oct.
Dec.
2010
2011
Year

Summary

Tidal studies reveal:

- strong variability at seasonal and PW periods
- semidiurnal amplitudes are large, larger than GSWM
- diurnal amplitudes are small, smaller than GSWM
- phases agree with GSWM over some altitudes for some intervals

Planetary wave studies reveal:

- large hemispheric differences in PW structures, occurrence
- strong amp./phase variability of the 2-, 5-, 8-10-, and 16-day PWs
- 2-day wave is most localized, largest response in both hemispheres